

MATHEMAGIC

-THE SMART CARD-



AMAZINGMATHS

Materials:

- Magic trick video
- Deck of cards (1 per team)
- Sheets of paper
- Pencils

How to do the Magic Trick

1. The magician distributes 15 cards to the spectator and to himself.
2. Each person cuts their pile once, at whichever height.
3. The spectator picks a card from the pile of cards that was not distributed, looks at it and places it face-down in one of his two piles.
4. The magician also picks a card from the pile that was not distributed and places it face-up on one of his two piles (this card will be the *Smart Card*).
5. In the same order as the video, the magician gathers all four piles (the spectator's 2 piles and the magician's 2 piles) into one large pile. From the bottom to the top, we have: the magician's pile with the *Smart Card*, the spectator's pile that does not include the chosen card, the spectator's pile that does include the chosen card, and the magician's second pile.
6. The magician separates this large pile into two piles, by distributing the cards in an alternating manner. Once he has finished separating the pile, he keeps only the pile that contains the *Smart Card* and disregards the other pile. He then separates that pile into two new piles, and once again he keeps only the pile that has the *Smart Card*. He repeats this distribution/elimination step until the only two cards remaining are the *Smart Card* and the card chosen by the spectator.



MATHEMATICAL EXPLANATION



Why the Trick Works

When the magician gathers the four piles into one large pile, he ensures that both featured cards (the *Smart Card* and the card chosen by the spectator) are separated by one whole initial pile. This means that both cards are separated by exactly 15 cards.

If we consider that the *Smart Card* is at position 0, then the spectator's card is at position 16. Therefore, the two cards are placed at positions of the same parity. This ensures that after the magician alternately distributes the pile into two new piles, both cards find themselves in the same (now smaller) pile.

After this first separation, we find ourselves with two piles of 16 cards each. Both featured cards are in the same pile and are now separated by 7 cards. Thus, if one of them is in position 0, the other is in position 8. They are then, once again, placed at positions of the same parity. By this same reasoning, they will find themselves in the same pile each time a new distribution is done.

Note the fact that 16, or 2 to the power of 4, plays a crucial role in this trick because we divide the number of cards by 2 four times as we want both featured cards to remain in their same position of parity.